## ABSTRACT

A neutron detector technology based on $^{10}B$ thin film conversion of neutrons and detection of neutron capture reaction products in a counter gas within a thin straw tube detector body is described. This neutron detector is based on gas-filled thin wall straw tubes, modified for the conversion of neutrons in a very thin coating, or layer, of $^{10}B$, applied for example as a sputter-coated film of $^{10}B_4C$, that lines the interior, or inside of the straw tube surface; and the subsequent detection of the neutron reaction products in the counter gas. One embodiment of this invention employs a closely-packed array of $^{10}B_4C$- lined straw tubes employing a very thin and therefore high efficiency $^{10}B_4C$ layer, hence removing the barrier to efficient neutron capture reaction product escape while still providing for efficient neutron capture by providing a plurality of very thin $^{10}B$ converters, each individual converter element providing efficient reaction product escape. Using such densely packed straw tube detectors of small diameter, a reasonable stack depth allows a high neutron detection efficiency to be achieved on the 1-10 Å wavelength range of thermal neutrons. The position of each interacting neutron can be accurately obtained with for example, resistive charge division readout combined with straw decoding electronics to determine the identity of the struck straw.